"multiple injury" as their main diagnosis, reflects the development of more effective fragment-producing weapons; the majority of those multiple injured at Jalalabad were hit by mortar grenade fragments, the hits being regularly of the high-energy type with extensive tissue damage. The high number of serious mortar casualities, is another reason for the "under-representation" of chest- and abdominal injuries among the Jalalabad casualities.

Surgical management and anaesthesia

In order to plan the surgical approach, evaluation of the actual missile energy output and knowledge of the caracteristic features of the main missiles are essential(9). The MMC staff takes a **weapon history** for all patients, a brief record of the exact type of weapon used, the range of the hit and the time delay from injury up to admittance at the clinic. Also in blast injuries, the record of injury is carefully collected; the distance between the patient and the explosion, and if he had some protection against the blast wave. In AP-mine injuries we differ between the light mines ("butterfly" type) carrying 20-30 g explosives, and the heavier shock mines carrying 50-150 g of wxplosives; the extent of muscle necrosis above the amputation level is far greater for the heavier AP-mines. Different rifles has different damaging potential, mainly due to different patterns of bullet fragmentation (3). At Jalalabad the Russian AK-47 is the standard battle rifle. The wound track of an AK-47 bullet has its caracteristic features: During the first 5-10 cm of its wound track, the usually cause onlu moderate tissue damage; but 10-15.cm inside the inlet wound, the tissue damage along the track is extensive, and structures may be destroyed even if they are not directly hit by the bullet. The modern Russian mortar grenades used at Jalalabad probably represent a "new generation" of grenades, producing multiple minor fragments with higher velocities than its predecessors(4).

Surgical debridement at MMC follow the established guidelines for that surgical procedure (1,2,5): Wide excision of necrotic fat tissue, of necrotic muscle and particulary of tissue close to compound bullet fractures; before debridement, we install soap solution for 10 minutes into wounds late for surgery (more than 8 hours since time of injury). Fasciotomy (single or double) is done in limb injuries if the muscle necrosis is extensive, if a major wound is infected, in high energy traumatic amputations and in artery injuries. All wounds are left open with wide dependant drainage or gauze drainage; in deep limb injuries, penetrating drainage is applied.

In open fractures, minor loose bone fragments are removed; major fragments without tissue attachment are removed, thoroughly washed in soap solution, rinsed and replaced at the fracture site; splints are used for immobilization, definitive reduction and fixation is left for second-line management.

In traumatic amputations caused by the heavy type of AP-mines, we often find necrosis along one or two muscle bundles far above the amputation level, and wide fasciotomies are mandatory to identify and excise the necrosis.

Long missile tracks (10-20 cm) in the adult femur or buttock are injuries particulary prone to develop resistant wound infections and anaerobic infections(5); debridement is done through wide/double exploratory incisions and the deep drainage is particular careful(5).

Some types of injuries are not debrided at MMC: Limb artery injury needing artery reconstruction, is evacuated as **"urgent"** to second-line with only fasciotomy and drainage done at MMC; if they are evacuated for second-line, low energy limb injuries are managed by drainage without debridement. Head and major face injuries are evacuated as **"urgent"** as soon as free airways are established, forward debridement will just delay brain decompression and expert face- or eye surgery. When our clinics are under military pressure or working with mass casualities, limb injuries otherwise debrided may be managed by "modified debridement": Fasciotomy and dependant drainage - without excision of necrotic tissue; this rapid procedure is far better than nothing, and finished in less than 5 minutes.

In penetrating chest injuries, thoracic drainage is applied and inlet/outlet wounds are closed after debridement.

Even minimal high velocity fragments may cause penetrating abdominal injuries with extensive visceral damage. There is no room for observation of "may-be-penetrating" abdominal cases at forward clinics. MMC stick to the policy of further evacuation without forward surgery of all cases with abdominal hits, wether the diagnosis of "penetrating" can be confirmed or not. In all pelvic or buttock injuries we look for blood by the stools or hematuria (bladder catheterization). In cases with evisceration, care is taken to leave the injured bowel outside the abdomen.

In major burns we concentrate on agressive volume therapy; care of the burn wound has no priority in forward surgery.

Minor injuries are managed in local anaesthesia. Regional anaesthesia is time consuming and is not applied at MMC. The majority of debridements are performed under low-dose i.v. ketamine anaesthesia (0,5 mg/kg body weight). Except for hallucinations, we have seen no side effects with this method. In low doses, ketamine does not interfere with diagnosis or further management at second-line hospitals.

forward clinics, and even more so in less organized guerilla settings and areas with poor communications.

Our results document that even minor forward clinics with simple equipment may have a remarkable capacity; more than 3000 war-casualities has passed our two clinics during 20 months, with a cost per patient of less than 1000 Rs. Emergency medicine is traditionally expensive, the clinics and staff must have a continuous stand-by capacity good enough to cope with mass casualities. In that regard, we find the role of experienced paramedics essential: They cannot substitute a doctor on regular base, however, they should be trained to perform some doctor's procedures during mass casuality management. Thus they add to the clinic capacity, reduce the total running costs, and enables a smooth flow of patients even under high casuality loads.

The weakest part of the war-time echelon for medical care, use to be its forward parts. That is also so for evacuation of casualities at Jalalabad; it is not satisfactory that the majority of war-injured arrive at our clinics without prior resuscitation. In our opinion, this is the single most important factor contributing to a high rate of early and late complications. For many years Western organizations have run first-aid training courses for mujahedin "medical men"; that training does not include ballistics of common weapons, advanced ABC-support, nor are the trainees given equipment or drugs necessary for effective front-line resuscitation. At duty in the combat area, those trainees may well prevent minor complications in minor injuries, but faced by moderate or major injuries gauze, scissors and 1 l glucose have just symbolic value. It is our experience that well educated and experienced paramedics can and should perform high standard forward resuscitation, including procedures like chest drainage, venous cut-downs and agressive analgesia; rather than educating lots of amateurs, the relief organizations should concentrate on support for professional, small forward medical units. From the MMC side, we will improve the very forward part of our network by better wire-less field communication, by more field-working ambulances, and an even better education of our paramedics assisting the ambulances.

To our knowledge, cluster- and chemical weapons are not used at Jalalabad; however, the late models of traditional conventional weapons have an impressive damage capability, particulary so the modern mortar grenades. Thorough knowledge of types of weapons and their ballistic properties is essential for all medical staff engaged in war casuality management. This is gradually recognized among war-time surgeons (2,9); in our opinion it is even more important in minor forward clinics with poor diagnostic facilities. The guidelines for triage should also include an evaluation of the actual damaging weapon.

Most reports on battle casuality care are rewievs from western armies where malnutrition and endemic diseases so

Medical considerations and drug therapy

Particulary in children, complications due to over-heating is common during evacuations at summer; good ventilation inside the ambulances is important. Malaria cases may develop a sudden malaria crisis with extreme fever during hours after injury; patients with active or recent manifestations of malaria are given i.v. malaria prophylaxis before evacuation up to second line.

At winter time and during the rainy season, patients may arrive with body temperatures of 32-35 degr.C after long evacuations. Also patients hiding for hours in water canals, patients with extensive injuries and burns, children particulary so - loose body temperature to a degree that may cause circulatory complications. Warm infusions (infusion set tube running through hot water) and blankets are used for careful, step-wise heating; small children particulary loose temperature by their head and neck, those areas should be protected by warm clothes.

A short medical record is taken at MMC regarding conditions and diseases that are known to complicate injury management: Longlasting physical exhaustion, malnutrition, tuberculosis, chronic amoebic disease, other chronic gastro-intestinal disorders, typhoid fever. The presence of any of those conditions are noted on the reference slip following the patient, that information being essential both for our triage and the second-line management.

The use of prophylactic antibiotics are of dubious value in prevention of wound infections(6); high i.v. doses of penicilline (2-10 mill.IU), may be of some prophylactic value regarding anaerobic infections and is given to all major limb injuries. Human immuno-globulin against tetanus is not used at MMC. Penetrating chest- and abdominal injuries get i.v. ampicilline 2 g and i.v. metronidazole 500 mg as a prophylactic measure.

Discussion

Our present knowledge of the care of battle casualities is mainly based upon experience from conventional Western army hospitals during late regional wars. At Jalalabad we have applied their experiences to a guerilla war-fare setting. Good results from early surgery in forward surgical clinics are documented from other guerilla-like wars(7) and from city war-fare(8). Our experience at Jalalabad confirms the importance of surgical first-aid and early debridement in clinics close to the combat area. Compared to battles fought by guerilla armies in other Afghan regions or elsewhere in third world countires, the fighting at Jalalabad is fairly well organized; still casualities arrive at our clinics with a considerable delay, and the effective evacuation time from our clinics up to the second-line operating table is 6- 12 hours; these facts justify our concept of early surgery in common among third world people, are seldom seen. Among guerilla soldiers and civilians in poor countires, however, those diseases are common causes of early and late complications after injury. It is our experience from Jalalabad that the guidelines for triage cannot be fixed; they should be adapted according to the particular diseases common in the actual area, and the medical staff at surgical clinics should study the main features of those diseases.

References

(1) Emergency War Surgery. First US revision of the Emergency War Surgery NATO Handbook. S.E.A.Publications, 1982.

(2) Jones,E. et al: Early Management of Battle Casualities in Vietnam. Arch.Surg 97-1 July 1968.

(3) Fackler,M. et al: The Wound Profile: A visual Method for Quantifying Gunshot Wound Components. J.Trauma 25-6 1985.

(4) The UNOCA de-mining team, Peshawar, may 1989. Personal message.

(5) Trueta,J: The Principles and Practice of War Surgery. C.V.Mosby Company, St.Louis 1943.

(6) Mattox,K. et al: Trauma. Appleton&Lange 1988.

(7) Jackson,D.S. et al: The Falklands War: Army field surgical experience. Ann.Roy.Coll.Surg.Engl. 65 1983.

(8) Fosse,E., Husum,H. et al: The Siege of Tripoli 1983: War Surgery in Lebanon. J.Trauma 28-4 1988

(9) Owen-Smith,M.S.:High-velocity Missile Wounds. Edward Arnold, London 1981.

FORWARD WAR-TIME SURGERY IN AFGHANISTAN
Management of 3,300 Battle Casualities by MMC at Jalalabad

Dr. A.Reha M.D., MMC, Peshawar[1]
Dr. H.Husum M.D.,NCA, Norway[2]

Mujahad Emergency Medical Center (MMC) is an Afghan run forward medical unit at Jalalabad, one of the major cities of Afghanistan. Since march 1989 mujahedin forces have led siege to Kabul regime forces inside the city, an intensive battle is fought with modern conventional weapons. The MMC mobile surgical clinics of MMC are located close to the combat areas, and have been the main units responsible for early management of war casualities at Jalalabad. From march 1989 up to october 1990 MMC has managed and evacuated 3.300 war injured from the outskirts of Jalalabad. This report rewievs our experience so far with some particular types of conventional weapons. The principles for recuscitation and primary surgery to war injured has been developed during recent regional wars in major army hospitals; the report discusses our experiences with these principles applied to field conditions in small forward clinics under direct military pressure.

In march 1989 MMC established one mobile tent clinic at the Jalalabad-Peshawar highway 20 - 30 km east of Jalalabad. Initially the clinic was manned by 3 Afghan G.P.doctors and 5 paramedics, all experienced in war casuality management. During may and june 1989 the clinic was assisted by Norwegian surgeon and anaesthesiologist, training the staff in recuscitation and primary surgery. During our first three months of action, we experienced an early mortality rate of 20-40% among the casualities (table 3). At that time the mean delay from time of injury up to arrival at MMC was 5 hours. Due to this delay and high casuality loads upon the clinic, MMC extended its network along the combat fields, expanded its medical staff and established another clinic south of Jalalabad in order to improve the early management of casualities. With support from Afghan Aid[3], MMC has 1-2 4WD ambulances attached to each clinic. The clinics have no bed departments, the casualities are evacuated to rear ICRC post for further evacuation to second-line hospitals in Peshawar.

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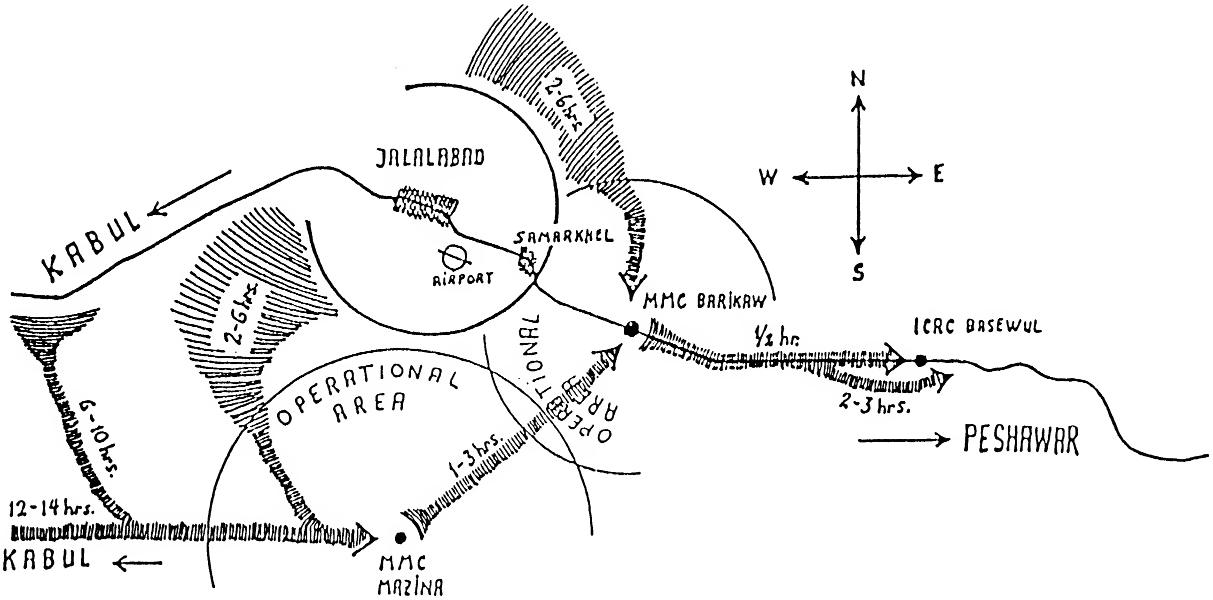
[1] Medical director of MMC, Gul Haji Plaza, University rd, Peshawar, N.W.F.P., Pakistan.

[2] Consultant surgeon, Norwegian Committee for Afghanistan, Peshawar.

The military front-lines at Jalalabad are continuously changing; at times our operational area has been under aerial pressure, and the clinics under direct artillery fire. In order to cope with a constantly changing casuality load and maintain our own security, the localization of MMC clinics are constantly changing. In the map below the general pattern of the MMC network is demonstrated; the shaded arrows show the casuality input to the clinics and the time delay in hours from injury up to admittance at our clinics.



Facilities and organization

The rate of early and late complications after war-time injury rise considerably if recussitation and primary surgery is delayed (2,6,8). At Jalalabad the majority of casualities arrive at the clinics with a mean of 2-4 hours delay from the time of injury; for some casualities the delay may be 12-48 hours due to localization or heavy military pressure. To this primary delay one should add another 2-3 hours for evacuation up to Peshawar hospitals - and still another 1-4 hours in hospital delay. Based upon these estimates, we found it necessary to perform primary debridement in the majority of MMC casualities.

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[3] A Peshawar-based European non-governmental organization

Each clinic is manned with 1-2 doctors and 3-4 paramedics in addition to drivers, guards and workers. The senior doctor is in charge of triage, giving spesific orders for each patient. The function of medical staff members is specialised so that each of them is responsible for particular procedures - i.v. infusions, analgetics, anaesthesia/monitoring of vital signs etc. Two operating tables are run in parallel, with operating teams composed of one doctor and one paramedic working sterile with one unsterile working assistant. Admittance of more than 5 serious cases during 1 hour is not infrequently seen; then recussitation and debridements are also done by experienced paramedics according to orders from the senior doctor.

The clinics are equipped with the basic simple instruments and facilites needed for primary surgery (table 1). In order to maintain mobility, the MMC clinics are "light": They have no el-supply, battery run head-lights are used during operations; sterilization is done by plain boiling of instruments for 30 minutes at 100 degr.C in clean water; sterilization is maintained by storage exposed to formaline gas in metal boxes. The clinics have neither x-ray nor laboratory facilities.

TABLE 1
Surgical instruments and facilities for one clinic

2 operating tables
2 head-lights
2 instrument tables
2 suction apparatus (1 light "pistol" hand sucction, 1 major suction).
ABC-sets (table 2)
Equipment for ketamine- and regional anaesthesia
Kettles, metal boxes and formaline for instrument sterilization
3 minor debridement sets
1 major debridement set
Orthopaedic instruments (saw and bone cutter)
Disposables for 30 casualities

At any time 1 or 2 ambulances operate from each clinic. Poor road conditions, field driving and needs for staff security put high demands upon the ambulances; regular maintainance is emphazised; after more than 100.000 km run, ambulances should be exchanged. One ambulance is present at the clinic at any time, and can respond to wire-less calls from mujahedin groups to evacuate casualities from the battle field. Field-operating ambulances carry ABC-set and one experienced paramedic, and can start recussitation at the site of injury. However, still the majority of casualities reach the clinics without prior recussitation.

TABLE 2
MMC standard equipment for recussitation / ABC-sets

Airway
Pharynx tubes
Hand ("pistol") sucction
Gauze (tamponade of bleeding face/mouth injuries)

Breathing
Mouth masks for assisted ventilation
Rubens bag for assisted ventilation
Chest tube set
Gastric tubes

Circulatory
5 l inf. Ringer or NaCl
2 l inf. Hemaccel
I.v. cannulas (Veneflon) (1,4 and 1,8 mm)
Infusion sets
I.v. catheters for children
Tourniqet (BP-apparatus)
Large gauze compresses

Drugs
Inj. pentazocin
Inj. morphine/buprenorphine
Inj. ketamine
Inj. diazepam
Inj. metoclopramid
Inj. lidocaine
Syringes 5cc and 20cc

Others
Stethocope
Torch
Splints

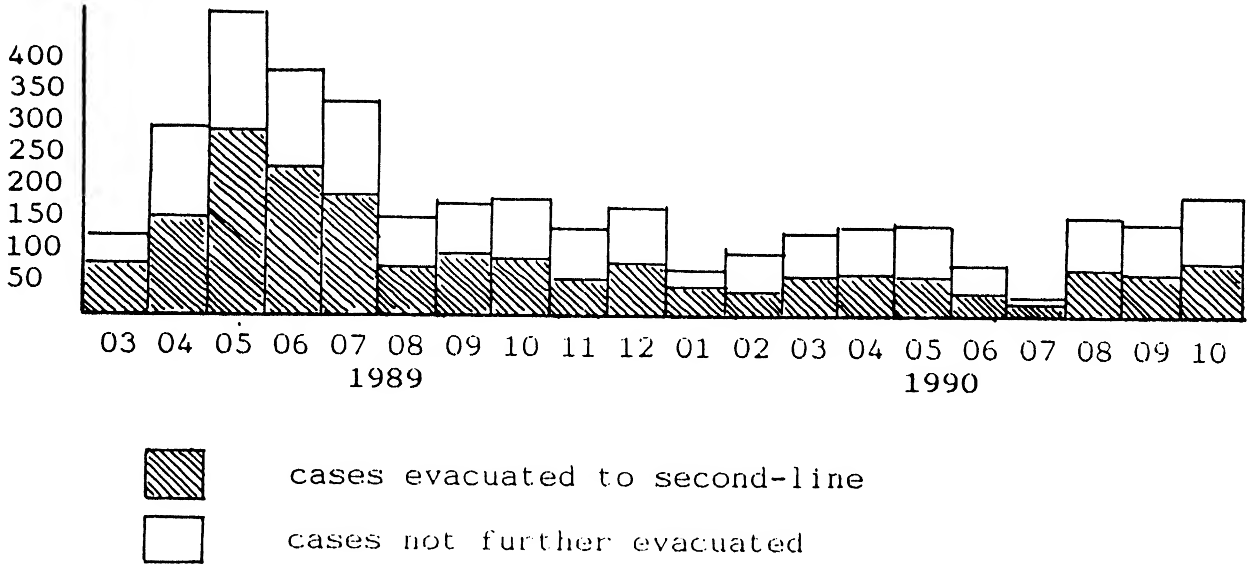
Casuality load

During 20 months, from march 1989 up to october 1990, the MMC clinics at Jalalabad managed and evacuated 3,320 war-injured. Of these, 25% were civilians; among the civilian casualities, 40% were less than 15 years of age.

Of the 3,320 casualities, 1,860 (56 %) were evacuated to Peshawar hospitals for delayed primary or secondary surgery; in periods with heavy casuality load or military pressure upon our clinics, even minor injuries was evacuated for second-line management. 1,460 casualities (44 %) had minor injuries and were discharged on the spot, treated as o.p.d. patients at MMC, or sent for rest and observation in villages or mujahedin bases nearby.

Casuality loads reflects the general intensity of fighting, and vary considerably from one month to another (Table 3).

TABLE 3
Monthly casualities



At times regime forces put mujahedin positions as well as villages under heavy air pressure; 50kg and 250 kg explosion bombs as well as air-to-ground rockets were used. There is no correlation between that air-pressure and casuality numbers or the rate of early mortality[4] (Table 4). During march and april 1989, the MMC clinic had a restrictive attitude towards advanced recussitation and primary surgery. Thereafter the clinic escalated its activity with field-working ambulances carrying paramedics, with aggressive recussitation (including chest drainage and active volume therapy), and primary surgery under anaesthesia. Table 4 shows a correlation between this escalation and a decreased rate of early mortality.

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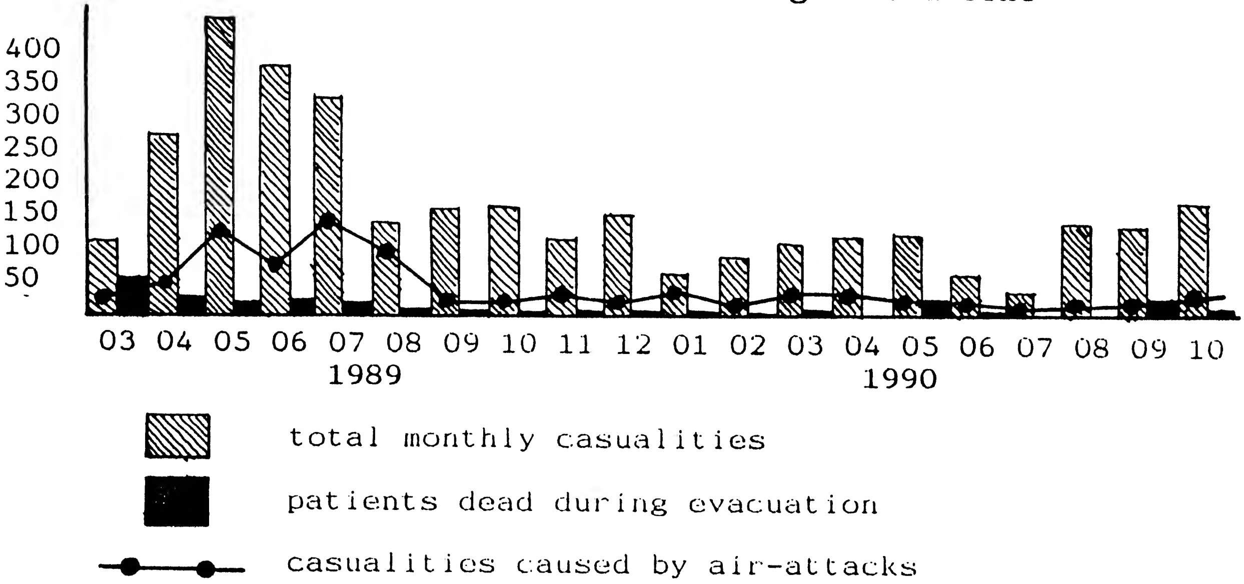
[4] Early mortality: Patients dead immediately or during evacuation up to the ICRC post at Basewul; that is, mortality during approximately 4 hours after injury.

TABLE 4
Monthly casualites caused by air-attacks related to total casualities and cases dead before reaching second-line



Resuscitation and triage

Resucitation at MMC is based upon the A-B-C-concept: Free airway - support the breathing - support the circulation. Doctors as well as experienced paramedics are trained to perform the following procedures:

Tracheal intubation is not done in MMC clinics; we use pharynx tube, reduction of face fractures and gauze tamponade of bleeding injuries to prevent airway obstruction.

Respiratory support consists of assisted ventilation with Rubens bag upon mouth mask; chest drainage with large bore chest tubes (probatory chest punction are done to confirm minor hematothorax); analgesia is essential, i.v. morphica and low-dose ketamine (0,2 mg/kg body weight) in repeated doses are used on wide indications; cases with chest tube achieve effective analgesia with installation of lidocain-NaCl solution by the chest tube; naso-gastric tubes are used for gastric decompression in penetrating low chest injuries and abdominal injuries.

Cases with any sign of circulatory shock is managed by double infusions through large bore i.v. cannulas (1,6-

fields, the infusion set plastic tube being used as vena saphena catheter in adults. Tourniquets may be used by field working ambulances, but are generally avoided at the MMC-clinics; vascular injuries are controlled by ligature of bleeding vessels - or ligature of the main artery proximal to the bleeding wound through a separate incision.

When the resuscitation is done and its effect observed, casualities are sorted (triage) regarding their priority for MMC surgery and further evacuation. MMC triage does not follow the standard guidelines for triage used in army hospitals (1). We found it necessary to modify these guidelines to make them fit a field setting: At a forward clinic, priorities given for further evacuation has to consider several factors:

- Whether the actual injury is a high- or low- energy injury: The kind of weapon used and the range of the hit are asessed.
- The general medical state of each patient: Certain endemic diseases may interfer with and complicate the injury.
- The actual diagnostic capacity and surgical standard of the forward clinic.
- The actual patient load there and then.
- The military situation in the clinic area; particulary during night under pessure from air-attacks, elaborate procedures may be hazardeous.
- The exact transport time up to second-line hospitals, the standard of evacuation roads and difficulties that might be encountered during that evacuation.
- The capacities and standards of the second-line institutions.

In classification of mass casualities at the MMC clinics (more than 5 serious cases at one time) the criteria for sorting are strict (Table 5):

- The classification is always based upon the general medical state of each patient and his delay since the time of injury: A penetrating abdominal injury or major muscular injury without vascular injury is generally classified as **"can wait"**; delayed 24 hours and infected, that same injury is classified as **"urgent"**. Poor general state due to physical exhaustion, certain endemic diseases or malnutrition, may also imply **"urgent"** classification of otherwise moderate injuries.
- All patients with partly blocking of airways are generally classified as **"urgent"**. Most penetrating chest injuries are satisfactory stable when managed by chest tube, sucction and analgetics, and are classified as **"can wait"**; only chest injuries with poor effect of chest drainage, or circulatory shock due to the chest injury, are classified as **"urgent"**.
- The MMC clinics have no facilities for blood transfusion; patients in grave shock is managed by electrolytes and plasma expander, resulting in grave anemia and hypoxemia. Those are

high risk cases regarding multiple organ failure and need **"urgent"** blood transfusion. Cases with less than grave shock, are classified as **"can wait"**, unless there is bleeding that cannot be controlled.

- At present, MMC clinics have no capacity for vascular reconstruction; injuries to main arteries should be reconstructed within 8 hours after injury, and those cases are classified as **"urgent"**.
- Head injuries with any sign of brain edema, brain necrosis or hematoma are generally classified as **"urgent"**; if decompressive surgery is indicated, it should be done within 4-8 hours; there is no time for further diagnosis or selection within this group of injuries in forward clinics. Cases with bilateral dilated eye pupils are considered "brain dead" and left for palliative treatment.
- Burns less than 40% is generally classified as **"can wait"**, unless their evacuation up to MMC is delayed and they arrive with considerable volume deficit.
- Blast injuries where the patient was close to the site of explosion, is generally classified as **"must wait"**, unless they have signs of rupture of stomach or bowel. Respiratory complications due to blast shock wave injury does not affect this general classification, those complications being resistant to any treatment.
- Close range hits by high velocity weapons, by bullets known to fragment, and multiple serious injuries are all factors generally increasing the priority.
- Children with respiratory and circulatory problems have general high priority.

TABLE 5

The guidelines for sorting of casualities as practiced at MMC

Urgent/Group 1: Airway obstruction; chest/abdominal injuries with poor respiration after resuscitation; chest/abdominal injuries with continuous bleeding; any grave circulatory shock, even stable after resuscitation; limb artery injuries for vascular reconstruction; head injuries with possible brain damage; burns of more than 40%; more than one "group 2 injury" in the same patient; any major injury in poor general state due to other diseases, malnutrition or delayed evacuation.

Can wait/Group 2: Chest/abdominal injuries with sufficient respiration; chest/abdominal injuries without circulatory shock; major limb injuries without major vascular injury; burns of 20-40%

Must wait or not referred/Group 3: All other moderate and minor injuries; blast injuries; head injuries with bilateral dilated pupils; dying patients.

Types of injuries and types of weapons

The serious injuries at Jalalabad (classified as Group 1 or 2 by MMC triage) constitute 30% of the total number of casualities (Table 6). The distribution of regional injuries are demonstrated in Table 7.

TABLE 6
Distribution of casualities as classified by MMC triage

	Number of cases	In % of total cases
Urgent/Group 1 :	297	10
Can wait/Group 2 :	688	20
Must wait/Group 3:	2307	70

TABLE 7
Distribution of wounds compared with other regional wars

Localization of main injury	Korea 1952 % of total casualities(2)	Vietnam 1967 % of total casualities(2)	Jalalabad 1990 % of total casualities
Head and neck	16	8,2	13
Chest	8	12,9	7
Abdomen	6	12,4	7
Upper and lower limbs	70	66,5	54
Multiple	-	-	19

In a setting of intensive conventional warfare, the forward clinic should expect approximately 1/3 of the casualities to be serious, the majority of which being head, abdominal and multiple injuries. The fewer chest- and abdominal cases at Jalalabad, are mainly attributed to a shortage of forward field evacuation at Jalalabad causing a high early mortality rate of those injuries compared to US casualitites air-evacuated in Vietnam.

During the Korean war, 70% of Western casualities were caused by aerial bombing; at Jalalabad 30% of our casualitites were caused by aerial attacks. Both in Vietnam (2) and at Jalalabad approximately 4% of the casualities were traumatic limb amputations, mainly caused by anti-personal/AP mines. The distribution of casualities in Vietanm should thus be comparable with our results at Jalalabad, both wars being mainly fought by close-range intensive battles between ground forces. The high rate of casualities at Jalalabad with